REMARKS

Entry of the foregoing and further and favorable consideration of the subject application, in light of the following remarks, are respectfully requested.

As correctly stated in the Official Action, Claims 1-26 are pending in the present application. Claims 1-26 stand rejected.

By the present amendment, a substitute specification is submitted eliminating verbosity and adding appropriate section headings. No new matter has been added.

By the present amendment, a new Abstract is submitted herewith. The Abstract is modeled on that submitted with the published PCT application PCT/SE99/01205. No new matter has been added.

By the present amendment, independent Claim 1 has been amended to recite positive steps in a method claim. Support for the amendment to Claim 1 is found in the specification on page 11, lines 8-12. Claims 1-26 have been amended as suggested by the Examiner in the Official Action. No new matter has been added. New Claims 27-34 have been added to incorporate subject matter that was canceled from Claims 8, 16, 23, 24, and 1. No new matter has been added.

Abstract

The abstract of the disclosure is objected to because the abstract is a copy of the PCT abstract. Applicants submit herewith a new Abstract on a separate page, avoiding legal terminology as requested by the Examiner. Withdrawal of this objection is respectfully requested.

Drawings

The drawings stand objected to because a copy of Figures 1-4 were allegedly not present in the application. Applicants submit herewith a copy of the postcard stamped by the U.S. Patent and Trademark Office showing that the Figures were submitted with the application. Nevertheless, Applicants also submit herewith a copy of Figures 1-4 (1 sheet) for the Examiner's convenience. Withdrawal of this objection is respectfully requested.

Specification

The specification stands objected to as not being written in full, clear, concise, and exact terms. Applicants submit herewith a substitute specification eliminating verbosity, as requested by the Examiner. The substitute specification contains section headings and avoids reference to the claims, as requested by the Examiner. Withdrawal of this objection is respectfully requested.

Claim Objections

Claims 2-7, 9-22, and 25-26 stand objected to for various informalities.

By the present amendment, Claims 2-7, 9-22, and 25-26 have been amended to delete "characterised." Claims 9-15 and 17-22 have been amended to recite the article "The." Claims 2, 9, and 25 have been amended to delete "in 100%." Reference numerals have been deleted from the claims. Claim 16 has been amended to recite "body," rather than "article" as requested by the Examiner. Claims 25 and 26 have been amended to

recite "The packaging," as suggested by the Examiner. Withdrawal of this objection is respectfully requested.

Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1-26 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. The Examiner argues that the claims are replete with improper claim syntax.

By the present amendment, independent Claims have been revised to recite a method with positive steps for practicing the method. The claims have been amended to remove terminology like "such as", "preferably," "possibly," "for instance," and "and the like," as requested by the Examiner. Claims 9, 10, 25 and 26 have been amended to specify which "material" is being referred to. Withdrawal of this rejection is respectfully requested.

Claim 15 stands rejected as allegedly reciting an invention inconsistent with the preamble. By the present amendment, Claim 15 has been revised to recite a packaged absorbent article comprising packaging material and one or more absorbent articles. Withdrawal of this rejection is respectfully requested.

Applicants respectfully submit that the presently amended claims fully comply with 35 U.S.C. § 112. Accordingly, withdrawal of this rejection is respectfully requested.

Rejections Under 35 U.S.C. § 101

Claims 1-7 stand rejected under 35 U.S.C. § 101, as allegedly improper process claims. By the present amendment, independent Claim 1 has been amended to recite a

method with positive steps for practicing the method. Withdrawal of this rejection is respectfully requested.

Rejections Under 35 U.S.C. 103

Claims 1-26 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the specification of the instant application, Barrocas *et al.* (U.S. Patent No. 4,232,179, "Barrocas"), Toms *et al.* (U.S. Patent No. 5,417,679, "Toms"), Bruggemann *et al.* (U.S. Patent 5,721,679, "Bruggemann"), Cargill (WO94/07941, "Cargill"), and Dupont (WO95/29200, "Dupont"). The Examiner asserts that the specification, Toms, and Cargill admit that it is known to produce components for absorbent articles from polyethene derived from non-renewable materials. The Examiner also argues that the instant specification, Toms, and Cargill disclose that the manufacture of polyethene is known. Accordingly, the Examiner surmises that the novelty of the present invention is the use of renewable raw materials in the manufacture of polyethene for use in absorbent articles or packaging materials. The Examiner argues that the instant specification, Bruggeman, Cargill, and Dupont disclose that it is desirable to make environmentally friendly materials or packages by using films, materials, and components used from renewable raw materials. Thus, the Examiner concludes it would be obvious to make absorbent articles from polyethene from a renewable raw material. This rejection, as it applies to amended Claims 1-26 and new Claims 27-34, is respectfully traversed.

In order to establish a case of *prima facie* obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation to modify the reference or combine

reference teachings, (2) there must be a reasonable expectation of success, and (3) the prior art reference(s) must teach or suggest all of the claim limitations. *See* M.P.E.P. §2142. Applicants respectfully submit that the Examiner has not established a *prima facie* case.

Applicants respectfully submit that none of the references, either alone or in combination, disclose all of the elements of the presently claimed invention, *i.e.*, the use of polyethene from renewable raw materials to make absorbent articles and packaging materials. Barrocas merely discloses a process for preparing ethene from ethanol and states that ethene has become an essential raw material in the plastic industry. Toms, Bruggeman, Cargill, and Dupont relate to the use of a **biodegradable** polymer material in absorbent products instead of **non-biodegradable** material, such as polyethene. Thus, Toms, Bruggeman, Cargill, and Dupont are all inapposite to the presently claimed invention.

The use of polyethene produced from renewable raw material in absorbent products or packaging materials has not been disclosed prior to the present application. The problem to be solved by the present application is to achieve absorbent products and packaging materials that can be produced in an environmentally friendly manner. Applicants were able to solve this problem via the use of polyethene produced from renewable raw material. Toms, Bruggeman, Cargill, and Dupont all relate to biodegradable polymers and their use in absorbent products and packaging materials, with the aim of finding plastic materials that can be **disposed** of in an environmentally friendly way. These publications seek to achieve the goal of being environmentally friendly by using biodegradable polymers and all state that **polyethene is undesirable**. For example, Toms states, "There is a particular need to

replace polyethylene backsheets in absorbent articles with liquid impervious films comprised of biodegradable materials, because the backsheet is typically the largest non-biodegradable component of an absorbent article." Toms, col. 1, lines 48-53. Accordingly, these publications teach away from the solution facilitated by the presently claimed invention. These publications thus relate to a different aspect of the creation of environmentally friendly absorbent articles, *i.e.*, environmentally friendly **disposal** of the products, and do not disclose or suggest making the article from a polyethene from renewable raw material.

The mere fact that cited publications can be combined and modified does not render an invention obvious by itself - the publications or combination thereof must also suggest the desirability of the combination itself. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); *See also* M.P.E.P. § 2143.01 *et seq.* Applicants respectfully submit that one skilled in the art, having knowledge of Toms, Bruggemann, Cargill, and Dupont, and having the task of developing absorbent products and packaging materials that could be produced in an environmentally friendly manner would not find a solution to this problem in these publications. One skilled in the art would not be motivated to use polyethene to solve this problem because these publications all emphasize that the use of polyethene is undesirable because of its low biodegradability. Indeed, all efforts prior to the present invention have focused upon how the materials in absorbent articles such as diapers will biodegrade and how to enhance this process, not upon the use of renewable raw materials to make the absorbent articles. Applicants submit that the Examiner's argument based on a

combination of Barrocas publication with the other cited publications is pure hindsight based on the disclosure of the instant specification.

The large amounts of money annually invested in adjusting products and processes in relation to environmental needs indicate the magnitude of the problem that the presently claimed invention helps solve and the series of technical problems in handling absorbent articles. The present invention also provides a significant advantage concerning the handling of garbage, particularly the incineration of the absorbent articles. One cannot understate the fact that closed CO_2 cycles that use renewable materials do not contribute to the greenhouse effect. By using renewable materials, the handling of fossil fuels can be avoided, *i.e.*, oil drilling, transportation, cracking, etc., and the disastrous consequences associated therewith.

Applicants particularly note that polyethene has been used in absorbent articles and as packaging materials for more than 20 years prior to the presently claimed invention, without anyone advocating the use of polyethene produced from renewable materials. This fact is especially remarkable given the enormous environmental discussions which have been ongoing for quite some years.

Applicants respectfully submit that, in light of the above comments, there is no disclosure or suggestion in any of the cited publications concerning the use of polyethene produced from renewable material in absorbent articles or as packaging materials. Moreover, the cited publications actually teach away from the use of polyethene in environmentally friendly absorbent articles. Accordingly, the present invention cannot be

rendered obvious by the cited publications. Withdrawal of this rejection is respectfully requested.

Conclusions

From the foregoing, further and favorable action in the form of a Notice of Allowance is respectfully requested and such action is earnestly solicited.

In the event that there are any questions concerning this amendment or the application in general, the Examiner is respectfully requested to telephone the undersigned so that prosecution of the application may be expedited.

Respectfully submitted,

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Date: January 2, 2003

Attachment to Reply & Amendment dated January 2, 2003

Marked-up Claims 1-26

1. (Amended) [The use of a material that includes] A method of making an absorbent article, the method comprising:

producing polyethene produced from renewable raw material, and

using the polyethene as a component of [an] the absorbent article[, such as a diaper, sanitary napkin, incontinence protector, panty liner, pant diaper or the like].

2. (Amended) The [use] method according to Claim 1, [characterised in that the material] wherein the component consists of [100% of] said polyethene.

3. (Amended) The [use] method according to Claim 1, [characterised in that the material] wherein the component comprises from 50 to 99% of said polyethene.

4. (Amended) The [use] method according to Claim 1, [characterised in that] wherein the component is a liquid impermeable backing sheet of the absorbent article.

5. (Amended) The [use] method according to Claim 1, [characterised in that] wherein the component is an outer sheet or top sheet of the absorbent article.

6. (Amended) The [use] method according to Claim 1, [characterised in that] wherein the component is a waist elastic of the absorbent article.

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Marked-up Claims 1-26

7. (Amended) The [use] method according to Claim 1, [characterised in that] wherein the component is a fastener device of the absorbent article.

8. (Amended) An absorbent article [such as a diaper, sanitary napkin, incontinence protector, panty liner, pant diaper or the like], wherein at least one component of said article is comprised of material that contains polyethene, wherein the polyethene has been produced from renewable raw material[, preferably from ethene produced from ethanol].

9. (Amended) [An] The absorbent article according to Claim 8, [characterised in that] wherein the polyethene-containing material consists [in 100%] of said polyethene.

10. (Amended) [An] The absorbent article according to Claim 8, [characterised in that] wherein the polyethene-containing material comprises from 50 to 99% of said polyethene.

11. (Amended) [An] The absorbent article according to Claim 8, [characterised in that] wherein said component is a liquid-impermeable backing sheet of the absorbent article.

12. (Amended) [An] The absorbent article according to Claim 8, [characterised in that] wherein the component is an outer sheet or top sheet of the absorbent article.

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Marked-up Claims 1-26

13. (Amended) [An] The absorbent article according to Claim 8, [characterised in that] wherein the component is a waist elastic of the absorbent article.

14. (Amended) [An] The absorbent article according to Claim 8, [characterised in that] wherein the component is a fastener device of the absorbent article.

15. (Twice Amended) [An] A packaged absorbent article [according to Claim 8, characterised in that said article is packaged either alone (19) or together with several (21) articles in] comprising a packaging unit [(20, 22)] comprising film that includes polyethene produced from renewable raw material[, preferably ethene produced from ethanol] and one or more absorbent articles according to Claim 8.

16. (Amended) A method of producing an absorbent article [such as a diaper, a sanitary napkin, an incontinence protector, a panty liner, pant diaper, or the like], [characterised by] said method comprising

producing ethene from renewable raw material[, preferably ethanol,];

[polymerising] polymerizing the ethene to polyethene[,];

producing film containing said polyethene;

forming at least one article component from said film[,];

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Marked-up Claims 1-26

feeding said component into a machine together with an absorbent body, and

[possibly] optionally other sheets[,]; and

joining said component to the absorbent [article] body.

17. (Amended) [A] The method according to Claim 16, [characterised by forming the] wherein said film is formed solely from said polyethene.

18. (Amended) [A] The method according to Claim 16, [characterised by forming the] wherein said film is formed from a mixture that includes from 50 to 99% of said polyethene.

19. (Amended) [A] The method according to Claim 16, [characterised by forming] wherein a liquid-impermeable backing sheet of the absorbent article is formed from said film.

20. (Amended) [A] The method according to Claim 16, [characterised by forming] wherein an outer sheet or top sheet of the absorbent article is formed from said film.

21. (Amended) [A] The method according to Claim 16, [characterised by forming] wherein waist elastic of the absorbent article is formed from said film.

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Marked-up Claims 1-26

22. (Amended) [A] The method according to Claim 16, [characterised by forming] wherein a fastener device of the absorbent article is formed from said film.

23. (Amended) A component of an absorbent article[, for instance a component in the form of a liquid-impermeable backing sheet (1, 7), an outer sheet or top sheet (3, 5), a fastener device (16, 17) or waist elastic (18, 23) from] comprising a material that includes polyethene, wherein at least part of the polyethene has been produced from a renewable raw material[, preferably ethene produced from ethanol].

24. (Amended) [Packaging] A packaging material [(20, 22) including] comprising a film, wherein the film includes a [comprised of] material that contains polyethene produced from renewable material[, preferably ethene produced from ethanol].

25. (Amended) [Packaging] The packaging material according to Claim 24, [characterised in that] wherein [the] said polyethene-containing material consists [in 100%] of said polyethene.

26. (Amended) [Packaging] The packaging material according to Claim 25, [characterised in that] wherein said polyethene-containing material comprises 50 to 99% of said polyethene.

MARKED-UP COPY OF

SPECIFICATION

USE OF A POLYETHENE MATERIAL PRODUCED FROM RENEWABLE RAW MATERIAL AS COMPONENT OF AN ABSORBENT ARTICLE, AND THE ABSORBENT ARTICLE[.]

CROSS-REFERENCE TO A RELATED APPLICATION

This application is a national stage filing under 35 U.S.C. § 371 of International Application No. PCT/SE99/01205, filed July 2, 1999, and claims priority under 35 U.S.C. § 119 to Swedish application 9802370-8, filed July 2, 1998.

FIELD OF THE INVENTION

The present invention relates to the use of material that contains polyethene produced from renewable raw material as a component of an absorbent article, absorbent articles, a method of producing an absorbent article, absorbent article components, and packaging material or units comprised of material that contains polyethene produced from renewable raw material.

BACKGROUND OF THE INVENTION

Much thought is given to the care and protection of the environment in present-day [societies.] society. Newspapers[,] and packaging materials comprised of glass, metal,

paper, plastic, etc., are recycled with the purpose of conserving existing resources, such as oil, [forest] forests, and metal. It is desirable to use materials that are as environmentally friendly as possible and that are reasonable in the manufacture of products. This is also very important with regard to the manufacture of sanitary and hygiene products for one-time use only, such as diapers, sanitary napkins, incontinence protectors or napkins, panty liners, etc., and with regard to the manufacture of packaging materials and packaging units. In addition to conserving [our] natural resources, it is also necessary to consider the environment with respect to the waste and contaminants to which it is subjected. Waste materials are dumped in garbage [tips, where they are kept and] dumps, for storage, in the long term, break down or [are], alternatively, are incinerated. [When we use so] So-called disposable articles and disposable packaging and wrapping materials[, these articles and materials also land-] also end up in garbage [tips] dumps, which expand in size, or are incinerated [and therewith generate], thereby generating contaminants and carbon dioxide (CO_2). This contributes to the undesired greenhouse effect and to the consumption of natural resources.

Part of [the] a community's resources is based on plants [(Plantea)](*Plantae*) that continuously reproduce. Other resources exist in limited quantities and are regenerated very slowly. Petroleum products are an example of such resources. The use of petroleum raw materials depletes existing resources available to the community. It has taken many

years for the oil [that we use] used today to form.

SUMMARY

The object of the present invention is to assist in alleviating these problems and to provide an absorbent disposable product and a packaging material that is more environmentally friendly than their known counterparts.

This object is achieved in accordance with the invention by the use of a material which contains polyethene and which is produced from renewable raw material. By "renewable raw material" is meant [here] a material produced from plant-based material. [The renewable raw material is produced by plant material.] Plants can be renewed by planting new trees, new potatoes, sowing new seed, etc. The opposite of a product produced from a renewable raw material is a product which consumes raw material that cannot be renewed, [for instance] e.g., polyethene produced from petroleum raw products. In TNC's Energy [dictionary] Dictionary, a renewable energy source is defined as an energy source that can be reproduced at the same rate as it is used. Examples of renewable energy sources are forest energy, energy forests, and energy crops. The [same significance of the] term renewable is used similarly here, [even] though it is not an energy source [that is] concerned but rather a raw material.

There are some examples of [what some people consider to be] environmentally

friendly absorbent articles. One example is [products] a product that can be used several times, by washing the [products] product between use. Cloth diapers are used in this way. US-A-[5, 032, 119] 5,032,119 teaches a reusable cloth diaper. Environmentally friendly disposable products can be products that comprise components produced from degradable material, such as polycaprolactone, polylactide, or latex material. WO-Al-9407941 teaches a film produced from polylactide, which is biodegradable and can be composted and which can be used in diapers, for instance. Another degradable material[,] that can be used in films comprises copolymers that include polycaprolactone and polylactide blocks, [such material being] as described in WO-Al-9529200. This film can be used in diapers, [for instance] e.g. Biodegradable latex material is used as film in diapers, as described in EP-A1-454 104. Polylactide is an example of renewable material that is used in absorbent articles. Starch, which is a renewable material, is also used in combination with polycaprolactone.

The invention relates to the use of material that contains polyethene produced from renewable raw material, as a component of an absorbent article, such as a diaper, a sanitary napkin, an incontinence protectors, a panty liner, a pant diaper or like articles.

The invention also relates to an absorbent article, such as a diaper, a sanitary napkin, an incontinence protector, a panty liner, a pant diaper or like article, where at least one component [is comprised of] comprises a material that includes polyethene [that has

been] produced from renewable raw material.

The invention also relates to an absorbent article which is enclosed in film packaging material that contains polyethene produced from renewable raw material, [said] wherein the package [either containing] contains one [article] or several articles.

The invention also relates to a method of producing an absorbent article, such as a diaper, a sanitary napkin, an incontinence protector, a panty liner, a pant diaper or like article.

The invention also relates to a component of an absorbent article, wherein the component may be a liquid-impermeable backing sheet, an outer sheet or top sheet, fastener means, or waist elastic, made of a material that contains polyethene that has been produced from renewable raw material.

Finally, the invention also relates to packaging material that includes film [that consists] consisting of a material which includes polyethene [that has been] produced from renewable raw material.

The components of the absorbent articles [in question] are all those that can be produced from polyethene[,] and [also] other conceivable components that may possibly be produced from polyethene. Examples of components produced from polyethene are plastic sheets that function as liquid impermeable backing sheets on absorbent articles, waist elastic in diapers [for instance], top sheets on sanitary napkins and panty liners [for instance], and

tape used as diaper fastening means.

Part of a packaging unit may comprise film material that includes polyethene. When the packaging unit is comprised of several parts, it is not necessary for all of these parts to consist of said material, but they may include another type of plastic film or some other suitable material, [for instance] e.g. The aforesaid packaging part may also have a form other than film in packaging units that can conceivably be produced from polyethene.

BRIEF DESCRIPTION OF THE FIGURES

The invention will be described in more detail below with reference to the accompanying drawings.

Figure 1 is a sectioned view of an absorbent article, such as a diaper.

Figure 2 shows a diaper from above.

Figure 3 is a side view of an absorbent article packaged in polyethene film.

Figure 4 is a side view showing several absorbent articles packaged in polyethene film.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Polyethene is at present produced by [polymerisation] polymerization of ethene obtained by thermal (vapour) and catalytic cracking of different hydrocarbons, all from

ethane derived from natural gas to crude oil.

The production of polyethene [will now be described, such production being] is discussed below, as described in Textbook of Polymer Science, Third Edition, Fred. W. Billmeyer, JR, A. Wiley-Interscience Publication John Wiley & Sons.

Ethene can be [polymerised] polymerized with benzene or chlorobenzene as a solvent. Both polymer and monomer in these compounds dissolve at the temperatures and pressures used, such that the reactions are purely solvent [polymerisations] polymerizations. Water or other liquids can be added to drain off reaction heat.

In continuous processes, [there are used] tubular reactors which may have diameters smaller than 2.5 cm and lengths of up to 30 m are used. The stainless steel pipe is filled with water, and ethene containing initiator and [possibly], optionally benzene, is introduced. Additional initiator and water or benzene can be injected into the system at one or more points along the pipe[,] or tube, so as to maintain the initiator concentration essentially constant through the reactor. Ten percent[, or a higher percentage,] or more of ethene is [polymerised] polymerized at the distal end of the reactor. The gas and liquid phases are continuously removed at this point and the polymer separated out. The ethene that remains is recycled, [subsequent to] after being purified.

Another process uses bulk [polymerisation] polymerization in a tower-type reactor. Ethene containing trace quantities of oxygen is introduced into the reactor at 1500 atm and

190°C. The reaction is kept essentially isothermic and is carried out to a yield of 10-15%. The reactor outlet passes to a separation vessel in which unconverted ethene is removed for recycling. The molten polyethene is cooled to a temperature beneath its crystalline melting point and passed through the usual terminating stages.

LDPE (low density polyethene) can be produced in the aforedescribed way[, this polyethene being]. LDPE is the polyethene used primarily in the manufacture of polyethene film.

HDPE (high density polyethene), which can also be used to produce film, can be manufactured in several ways, including radical [polymerisation] polymerization of ethene at extremely high pressures, coordination [polymerisation] polymerization of ethene, and [polymerisation] polymerization of ethene supported by metal oxide catalysts.

In coordination [polymerisation] polymerization of ethene, [there is used] a catalyst produced as a colloidal dispersion by reacting alkyl aluminium and $TiCl_{4[,]}$ in a solvent[,] such as heptane is used. Ethene is introduced into the reaction vessel under a weak pressure and at a temperature of 50-75°C. [Polymerisation] Polymerization heat is removed by cooling. The polymer is produced in a powder or granule form, insoluble in the reaction mixture. The catalyst is destroyed at the end of the reaction process[,] by allowing water or alcohol to enter the system, and the polymer is filtered or centrifuged off, washed and dried.

Supportive metal oxide catalysts can be used in different working processes, including solid beds, moveable beds, fluidized beds, and slurry processes. Ethene is supplied with a paraffin or cycloparaffin as an extender, at 60-200°C and a pressure of about 3.5 kPa. The polymer is recovered by cooling[,] or by solvent evaporation.

In the same process as that used to produce a HDPE, a polyethene having a certain degree of elasticity can be produced. In this case, [there is used] a metallocene catalyst and a small amount of some other monomer [is added], such as hexene or butene, are used.

Thus, at present ethene is taken from petroleum crude products, which are not renewable and which deplete natural resources in this respect. Furthermore, the incineration of polyethene results in the forming of carbon dioxide, which contributes to the undesired greenhouse effect.

According to the invention, renewable ethene is used to produce an environmentally friendly product, where the ethene is produced from a renewable raw material, such as ethanol. Ethanol is renewable when it is produced from a reproducible plant *(Plantae)*. Sugar is converted to ethanol and carbon dioxide by fermentation under the influence of yeast fungi: $C_6H_{12}O_6 \rightarrow +2\ C_2H_5OH + 2\ CO_2$. Potatoes, seed, forest raw materials or other plants are used in the fermentation process. Every fruit, berry, or plant constituent that includes sugar can be fermented.

Ethene is produced from the renewable ethanol, by dehydrating ethanol for instance. Alcohol loses a water molecule and forms alkene when heated with a strong acid. Ethanol is heated to 180°C with concentrated sulphuric acid:

C_2H_5OH (conc. H_2SO_4, 180°C)→ $C_2H_4 + H_2O$.

Polyethene can be produced from the renewable ethene in the aforedescribed manner, already known in the art. It is also known to produce ethene from ethanol in the manner described above. The novelty in the present context resides in the use of renewable raw materials in the manufacture of polyethene for use in absorbent articles, which according to the invention results in environmentally friendly absorbent articles. Polyethene is used as material in components of the article, [for instance] e.g., as liquid-impermeable backing sheets, outer sheets or top sheets, diaper fastening tape, or as waist elastic. The novelty also resides in the use of renewable raw materials in manufacturing polyethene for use as packaging material.

An alternative to ethene produced from renewable ethanol is "cracking" of long carbon chains to ethene, such as the carbon chains of oils and fats. In this process, the long carbon chains of oils and fats are broken down to smaller molecules, [of which some are] including ethene [molecules]. Naturally, in order to be renewable, the oils and fats will be vegetable oil and fats. Many compounds can also be reacted to form ethene via ethanol, [for instance] e.g., acetic acid and ethylene oxide.

The invention relates to an entirely novel use of material that contains polyethene produced from renewable raw materials in absorbent articles and packaging materials.

[It is not known in] On an industrial scale, it was not known to use polyethene [that has been] produced from renewable raw materials for the manufacture of environmentally friendly absorbent articles and environmentally friendly packaging materials [which represent a], lessening [of] the load on [our] the environment and which do not deplete existing petroleum resources. Another advantage afforded by the invention is found in the possible incineration of disposable products and disposable packaging materials subsequent to their use. Incineration of polyethene generates carbon dioxide. This carbon dioxide contributes to the undesired greenhouse effect. When using renewable raw materials, however, CO_2 is consumed in the formation of the plants. This positive effect is also obtained when the products or packaging materials are dumped on the garbage [or rubbish tip] dumps, since CO_2 has also been consumed in the formation of the plants in this case. The use of renewable raw materials thus has a mitigating effect on the greenhouse effect.

[The invention will now be described in more detail with reference to the accompanying drawing, in which

Figure 1 is a sectioned view of an absorbent article, such as a diaper;

Figure 2 shows a diaper from above;

Figure 3 is a side view of an absorbent article packaged in polyethene film; and

Figure 4 is a side view showing several absorbent articles packaged in polyethene film.]Polyethene is produced from renewable raw material, processed and then used as components of an absorbent article, such as a diaper, a sanitary napkin, an incontinence protector, a panty liner, a pant diaper, or like article. The polyethene produced from renewable raw materials is also used for packaging material components. The packaging components concerned are, [for instance] e.g., film or some other part of a packaging unit. Fig. 1 is a sectioned view of an absorbent article, [which may be] e.g., a diaper or a sanitary napkin[, and]. Fig. 2 illustrates [by way of example] an absorbent article in the form of a diaper. The absorbent article in Fig. 1 includes a bottom liquid-impermeable barrier sheet [1, which in this document is](1), referred to as a liquid-impermeable backing sheet [1](1), an absorbent layer [2](2), and a top liquid-permeable outer sheet or surface sheet [3 which is](3) intended to lie proximal to the wearer in use.

Fig. 2 illustrates a diaper [4](4) that includes a top liquid-permeable sheet 5, an absorbent sheet or unit [6](6), and a bottom liquid-impermeable, backing sheet [7](7), said sheets being delimited by two transverse edges [8, 9](8, 9) and two longitudinal edges [10, 11](10, 11). The diaper also includes longitudinally extending leg elastic [12, 13](12, 13) and possibly a liquid barrier [14, 15](14, 15) on each side of the longitudinal [centre] center line. The diaper also includes fastening devices in the form of fastener tapes [16, 17](16, 17) and waist elastic [18, 23](18, 23). The polyethene is used as component material in the

liquid-impermeable backing sheet, waist elastic, top sheet, and fastener tape. [Even other] Other components may conceivably be produced from material that contains polyethene. The liquid impermeable backing sheet [1, 7](1, 7) is the sheet that prevents liquid from leaking from the article. In the case of sanitary napkins and panty liners, the top sheet [3, 5](3, 5) may also be produced from polyethene. The outer sheet or top sheet [3, 5](3, 5) is the sheet that is uppermost and lies proximal to the wearer in use. This sheet shall be permeable to liquid, so that discharged liquid can be quickly drawn by suction down into the underlying absorbent sheet [2, 6](2, 6). Diapers also include waist elastic [18, 23](18, 23) and fastener devices [16, 17](16, 17) in the form of tape. The waist elastic [18, 23](18, 23) is positioned on the diaper in waist-height to make the diaper flexible and comfortable for the wearer in use and the fastener devices [16, 17](16, 17) in the form of adhesive tape or in the form of touch-and-close fasteners by means of which the diaper can be secured in use so as not to loosen from the wearer.

By way of example of an absorbent article, Fig. 3 shows a folded sanitary napkin [19](19) enclosed in a packaging unit [20](20) comprised of film that includes polyethene produced from renewable raw material [and]. Fig. 4 shows several sanitary napkins [21](21) respectively wrapped in [respective] packaging material [21](20) which comprises film that contains polyethene produced from renewable raw material, said individual packets being enclosed in a packaging unit [22](22) comprising film material that includes

polyethene produced from renewable raw material. The absorbent articles in the packages may include components comprised of material that includes polyethene produced from renewable raw material, although absorbent articles that include components made of completely different materials may also be included. In the packaging method illustrated in Fig. 4, one of the packages [(21](20, 22) may consist of film material that includes polyethene produced from renewable raw material, while the other packages may consist of a completely different material.

The invention thus relates to the use of a material that contains polyethene produced from renewable raw material as a component of an absorbent article, such as a diaper, a sanitary napkin, an incontinence protector, a panty liner, a pant diaper or the like.

The material used may comprise up to 100% polyethene that has been produced from renewable raw material. Alternatively, the polyethene may be mixed with other materials, such as starch, for facilitating degradation of the material[, for instance]. Many different materials can be used together with the polyethene. Examples include other renewable materials, nonrenewable materials or fillers. When the material used contains polyethene produced from renewable raw material and [also contains] some other material, the polyethene may be present in an amount corresponding to about 50 to 99% and the remainder consisting of some other material. The percentile proportion of said other material will depend on the nature of the material and the reason why it has been mixed

with the polyethene. [In respect to] With relatively large percentages of polyethene, the polyethene may be present in quantities corresponding to 60-80%. At times, only[,] a small percentage of this other material will be used, e.g. [percentages of], 5% or from 1 to 20%, [for instance,] in which case the polyethene produced from renewable raw material will be 95% or from 80 to 99%. A feasible material mixture is one in which there is used polyethene produced from renewable raw material and polyethene produced from a petroleum product. The proportion of polyethene produced from renewable raw material will vary from 1 to 99%. Thus, the percentage of polyethene produced from renewable raw material will depend on the purpose and on the material mixed therewith.[The material described above is also included in a following Claim as a mixture.] When the polyethene produced from renewable raw material is mixed with some other material, this is also referred to as a mixture. The material composition described here also applies to the material, used as packaging in accordance with the invention.

The components used in the absorbent articles are produced in accordance with known technology. Film can be produced and used in the manufacture of liquid-impermeable backing sheets which are then included in the diaper manufacturing process, this process also being carried out in accordance with conventional methods. Film can also be used as tape for the fastener devices. Top sheets and waist elastic are also produced in a conventional manner [and included] for inclusion in the conventional

manufacture of absorbent articles. For instance, top sheets may be made of film and then perforated. Surface material can also be produced in [the form of] nonwoven form, by carding [fibres] fibers that are then bonded in ovens. However, [this is a question of] such nonwovens can be made from bicomponent [fibres] fibers of polyethene/polypropene. In the case of metallocene catalysts, elastic polyethene material can be produced for use, e.g., in waist elastic subsequent to having produced film from said material. As before mentioned, the components may be, e.g., backing sheets, i.e., liquid-impermeable sheets, found in all types of absorbent articles, top sheets found in, e.g., sanitary napkins and panty liners, waist elastic in diapers and fastener devices found primarily in diapers. The components [recited in the depending Claims] will thus be contingent on the type of article concerned in each respective case.

The invention also relates to a method for producing an absorbent article such as a diaper, a sanitary napkin, an incontinence protector, a panty liner, a pant diaper or the like, in which ethene is produced from renewable raw material, preferably ethanol[, and polymerised]; polymerized to polyethene, wherein a film containing polyethene is obtained[, by]; forming at least one article component from said film[, and]; by feeding the component into a machine together with an absorbent body or pad and possibly remaining sheets[,]; and joining the components together to form an absorbent article.

An absorbent article will normally include a bottom liquid-impermeable barrier

sheet, an absorbent sheet on top of said liquid-impermeable backing sheet, a top liquid-permeable outer sheet [which is] intended to lie proximal to the wearer in use, waist elastic and fastener devices.

A life-cycle analysis (LCA) comprises the stages included in the aforesaid method and also in the use of the absorbent article and the recovery of the used article. In the article recovery process, the article is broken down or incinerated. Carbon dioxide generated during combustion or degradation and in the production of ethanol is consumed in corresponding quantities in the new formation of raw materials, such as potatoes, seed and trees[, for instance].

Ethanol is produced from a plant in a conventional manner and ethene is produced from the ethanol as described above. The ethene is then [polymerised] polymerized to polyethene, [which has also been] as described above. The components to be included in the absorbent article are then produced. The component produced may be film for use in producing the liquid-impermeable backing sheet of an article. Film may be produced by a film blowing process, by a [moulding] molding process, or by cold roll extrusion. The film is then introduced into the article manufacturing process in a conventional manner in which the film is applied to the article, [for instance] e.g., in a diaper manufacturing machine. Alternatively, the component can be produced in some other way, [for instance] e.g., as components for use as top sheets described above. [Subsequent to its] After

manufacture, the component is introduced into the article production line.

The invention also relates to an absorbent article component, said component being, [for instance] e.g., a liquid-impermeable backing sheet [1, 7](1, 7), a top sheet [3, 5,](3, 5), fastener means [16, 17](16, 17), or waist elastic [18, 23](18, 23) comprised of a material which includes polyethene, where at least a part of the polyethene is produced from renewable raw material, preferably ethene produced from ethanol.

The invention also relates to an absorbent article, such as a diaper, a sanitary napkin, an incontinence guard, a panty liner, a pant diaper, or [the] like article, where at least one component is comprised of a material that contains polyethene [that has been] produced from a renewable raw material, preferably ethene produced from ethanol.

The articles will normally include a bottom liquid-impermeable backing sheet [1, 7](1, 7), an absorbent sheet or absorbent unit [2, 6](2, 6) which lies on said sheet, a top or upper liquid-permeable outer sheet [3, 5,](3, 5), fastener means [16, 17](16, 17) and waist elastic [18, 23](18, 23).

These absorbent articles (4, 19, 21) can be packed individually, as [at 19, or as indicated at 20, 22,] shown in Fig. 3 (19), or as shown in Fig. 4, several articles [21](21) may be packed and packaged in polyethene film produced from renewable raw material, preferably ethene produced from ethanol. When the absorbent articles [19, 21](19, 21) are packaged in a larger, multi-pack unit [22](22), they may already be enclosed in individual

packets [19](19) or may lack such packeting. Prepacking and the manufacture of the prepack or package are effected in accordance with known methods.

The invention also relates to absorbent articles which are packaged individually [as at 19](19), as shown in Fig. 3, or where several articles [21](21), as shown in Fig. 4, are enclosed in a packaging unit [20, 22](20, 22) comprised of film that contains polyethene produced from renewable raw material, preferably ethene produced from ethanol.

Finally, the invention also relates to a packaging unit [20, 22](20, 22) which includes film that is comprised of material which includes polythene produced from renewable raw material, preferably ethene produced from ethanol. In this case, as in all other embodiments of the invention, the material may consist entirely of polyethene produced from renewable raw material, or may comprise material that includes 50-99% polyethene. The examples of material and percentages mentioned above also apply to the packaging material.

The package is produced in accordance with conventional methods. For instance, film can be produced from the material that includes polyethene and a package then produced. As before mentioned, the packaging material component need not consist solely of film, but may also include some other component.

The packaging material including polyethene film produced from renewable raw material can be used in any selected type of packaging, preferably packaging of an

absorbent product, such as a diaper, a sanitary napkin, an incontinence protector, a panty liner, a pant diaper, or [the] like article. However, the packaging may also [concern] be used for paper wipes, [for instance kitchen] such as paper[,] towels and toilet paper, cloth wipes, and the like. Thus, the packaged product need not always consist of a product that includes a component containing polyethene produced from renewable raw material. Neither need the packaged article be an absorbent product.

The invention also relates to the use of a material that contains polyethene produced from renewable raw material to package different products.

One advantage afforded by the invention is that it is environmentally friendly by virtue of including components that are produced from material which contains polyethene [and which, in turn, is] produced from renewable raw material. This raw material does not deplete the petroleum sources of a community. Another advantage afforded by the use of renewable raw materials is that plants consume carbon dioxide as they develop, meaning that the greenhouse effect will not increase when using renewable raw materials instead of petroleum raw materials when said products are incinerated after use. This advantage also applies if the product is not incinerated, since the plant has already absorbed CO_2 [and therewith contributed], thus contributing to a reduction in the greenhouse effect.